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The Benefits of Education

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Summary

In a world of limited resources where policymakers must make tradeoffs among numerous government activities, sound decision-making entails knowing not only the benefits to society that result from schooling but also their value compared to other public investments. Social returns to investment in education are believed to include an informed and engaged citizenry, but how is this rather vague benefit to be conceptualized and assessed? Recent concern about globalization's impact on U.S. competitiveness has brought to the fore another perceived social benefit of the educational system, namely, its provision of highly qualified workers who enable the nation to sustain its rate of economic growth. The former is an example of a non-monetary public benefit and the latter of a monetary public benefit, neither of which individuals ordinarily consider when choosing how much schooling to undertake. Because they are not rewarded for the positive effects thought to spill over from themselves to others as a result of their pursuing additional schooling, individuals are likely to underinvest in education. The existence of such spillover benefits (i.e., human capital externalities) is a key justification for government support and promotion of education that may thereby move society toward an optimal level of educational investment.

But how can it be shown that education *per se* causes human capital externalities rather than other factors, some of which are not readily observable? For example, does the pay gap between college and high school graduates reflect differences between the two in productivity due to acquired knowledge or due to innate ability? Is voter turnout higher among the more educated because civics was part of their school curriculum or because their parents raised them to take seriously public affairs? Answers to these questions would indicate whether, and to what extent, education is a worthwhile investment for both individuals and society.

A voluminous literature on the private monetary return to education has developed over the last 40 years, with advances in statistical techniques applied to estimation of the earnings premium caused by schooling as recently as the 1990s. Education's private pecuniary rate of return is estimated to range from about 6% to 11%, which suggests that investing in formal education is a comparatively sound financial decision for individuals. Schooling seems even more worthwhile to individuals in light of its non-monetary returns (e.g., own health), although values are rarely developed for this type of benefit.

Researchers much more recently have focused on determining whether formal education causes public benefits. While the number of such empirical studies is increasing, estimates of the size of human capital externalities remain scarce due to the daunting analytical task of precisely measuring the monetary and non-monetary benefits that spill over from highly educated persons to other members of society. The results produced thus far are inconsistent, but they do offer evidence of the existence of human capital externalities — that is, government support for education is justified.

This report will not be updated.

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Federal spending on elementary, secondary (K-12) and postsecondary education exceeded $170 billion in FY2003.[1] This figure excludes the sizeable tax revenue that the federal government foregoes to encourage individuals to pursue additional schooling (principally postsecondary) and to support educational institutions. In FY2005, federal tax expenditures on education were estimated to be some $20 billion.[2] State spending on K-12 and postsecondary education dwarfs both these sums: in school year 2001-2002, states spent about $435 billion on K-12 education; in school year 2000-2001, public degree-granting institutions across the nation spent almost $137 billion.[3]

In a world of limited resources where policymakers must make tradeoffs among numerous government activities, sound decision-making entails knowing not only the full range of benefits to society that result from schooling but also their value compared to other public investments. Social returns to educational investment have long been thought to include an informed and engaged citizenry, but how is this rather vague benefit to be conceptualized and assessed? Concern about the ability of the United States to maintain its competitive position in an increasingly global marketplace has brought to the fore another perceived social benefit of the educational system: its provision of well-trained workers who enable a country to sustain its rate of economic (income) growth. A high-quality workforce also might dampen the cost of publicly financed remedies to potential displacement from international competition (e.g., the Trade Adjustment Assistance program and employment services under the Workforce Investment Act.)

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[1] William C. Sonnenberg, *Federal Support for Education FY1980 to FY2003* (Washington: National Center for Education Statistics, 2004). Note: The figure approximates many federal agencies' support for K-12 and higher education; research at educational institutions; and libraries, museums, and cultural activities. More specifically, it covers on-budget support from congressional appropriations (e.g., the Education Department's college student financial aid and the Agriculture Department's child nutrition programs); off-budget support (i.e., the loan volume in the Federal Direct Student Loan program); and non-federal funds generated by federal legislation (e.g., Federal Family Education Loans and Perkins Loans).

[2] U.S. Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2005-2009*, JCS-1-05 (Washington: GPO, 2005). Note: The figure includes such tax provisions as the Hope Scholarship and Lifetime Learning Credits, the deduction for charitable contributions to educational institutions, the exclusion of scholarship and fellowship income, the parental personal exemption for students age 19 to 23, and the exclusion of interest on state and local government bonds for private nonprofit and qualified public educational facilities.

[3] U.S. Department of Education, National Center for Education Statistics (NCES), The NCES Common Core Data, National Public Education Financial Survey; and Integrated Postsecondary Education Data System, Finance Survey.

The acquisition of education thus is perceived as increasingly important to the labor market success of individuals, which is the main private return to schooling. Seemingly now more than ever, the greater the knowledge people embody (i.e., their human capital), the better able they are to adapt to economic change (e.g., technological innovations) and thereby to maintain their comparatively high earnings with little interruption from unemployment during their working lives.

But how can it be demonstrated that education *per se* causes public and private benefits rather than other factors, some of which are not readily observable? For example, does the pay gap between college and high school graduates reflect differences between the two in productivity due to acquired knowledge or due to innate intelligence? Is civic participation higher among more educated persons because its importance is taught in school or because their parents raised them to take political and community affairs seriously? Answers to these questions would indicate whether, and to what extent, education is a worthwhile investment for both individuals and society.

This report provides an overview of the public and private benefits of education. Because it approaches education as an investment, the report does not address the consumption benefits of schooling.[4] It focuses on those benefits for which empirical research has examined the causal effects of education rather than studies that have established an association (correlation) between schooling and other outcomes. It should be noted at the outset that the variable this literature usually employs to represent learning is formal education as opposed to employer-provided on-the-job training or informal learning in the workplace for example.

Rationales for Government Support and Promotion of Education

> Paternalistic-type reasons, although not usually used by economists, are often used in popular discussions for providing education. Egalitarian arguments are also often used to justify government intervention. Imperfections in lending and insurance markets (i.e., borrowing constraints and uninsurable risk) and imperfect competition in labour markets can also warrant government involvement. And ... subsidizing education can efficiently counteract the distortions in human capital investment decisions caused by income taxation.[5]

Perhaps the most widely known economic justification for public involvement in education is that the total benefits from learning exceed those which accrue solely to the individual making the investment. People are likely to invest in education at less than socially optimum levels because they are not rewarded for, and therefore do not typically take into account, the positive effects thought to spill over from

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[4] These include such social benefits as community members' enjoyment of local high school and college athletic events, and such individual benefits as participation in college alumni activities.

[5] Philip A. Trostel, "Should Education be Publicly Provided?", *Bulletin of Economic Research*, vol. 54, no. 4 (2002), p. 374.

themselves to others as a result of their schooling decisions. The existence of spillover benefits from private educational investment (i.e., human capital externalities) suggests that government intervention in education can move society toward an optimal (efficient) result.

A nascent debate has developed in the empirical literature about the size of human capital externalities. To date, the disagreement is confined to one presumed external benefit, namely, the contribution of human capital to economic growth. (This matter is addressed directly later in the report.)

Those empirical studies of the education-growth nexus that find individuals are by far the major beneficiaries of their schooling decisions nonetheless support the conclusion that public expenditures on education are *not* wasted, that is, the social rate of return is positive (albeit perhaps small).[6] Put another way, formal education *does* enhance productivity rather than years of schooling merely signaling to potential employers a person's inherent characteristics (e.g., motivation). Even if educational attainment functions primarily as a signal, however, spending still would not be socially wasteful to the extent that possession of a degree permits employers to better screen workers for jobs (i.e., people are more appropriately matched with jobs, thereby enhancing productivity and economic growth).[7] For these among other reasons, signaling appears to have "lost favor among economists as a useful tool for analyzing educational choices or for policy analysis."[8]

The Public Benefits of Education

The public benefits of education can be of a monetary nature, such as raising national income and the earnings of less-educated members of society. They also can be of a non-monetary nature. These non-pecuniary benefits are more vague and less amenable to quantification than monetary returns. If measurement difficulties lead researchers to omit non-monetary transfers from more educated individuals to others, the consequences of education for society will be understated.

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[6] Robert Topel, "The Private and Social Values of Education," *Education and Economic Development: Proceedings of a Federal Reserve Bank of Cleveland Research Conference*, Nov. 18-19, 2004. (Hereafter cited as Topel, *The Private and Social Values of Education*.)

[7] Maria E. Menon, "An Evaluation of Four Decades of Rate of Return Analysis in Higher Education Policy Making: Weaknesses and Future Prospects," *Higher Education Policy*, vol. 16 (2003). (Hereafter cited as Menon, *An Evaluation of Four Decades of RoR Analysis in Higher Education Policy Marking.*) Jonathan Temple, "Growth Effects of Education and Social Capital in the OECD Countries," *OECD Economic Studies*, no. 33 (2001). (Hereafter cited as Temple, *Growth Effects of Education and Social Capital in the OECD Countries*.)

[8] Topel, *The Private and Social Values of Education*, p. 49.

Civic Participation

The development and stability of democratic societies is perhaps one of the most commonly asserted spillover effects of education. Schools in the United States teach students about the functions of government and make them aware of political, community, and other social issues. Schools also attempt to instill in their charges democratic values and behaviors (e.g., support for free speech and tolerance of others). Adults who have accumulated more years of education are presumed able to more readily and intelligently assess competing claims in political campaign literature and evaluate complex ballot initiatives. As a consequence, education is purported to enhance the quantity and quality of civic engagement.

Yet, there may be factors (individual-, family-, and community-specific) that simultaneously influence educational attainment and civic behaviors. If analyses do not take into account such characteristics — for which there may not be readily observable variables in data sets — correlation could be misinterpreted for causality and the public return to schooling could be overstated. In the 1990s, studies began utilizing methodologies thought to better distinguish the unique effects of education on civic participation and on other positive externalities.[9]

The results of one such analysis confirm that additional secondary and postsecondary education has a large, statistically significant impact on voting behavior.[10] For example, another year of high school attendance increases the likelihood of voting in a presidential election by almost 7 percentage points; college entrance increases the likelihood of registering to vote by some 22 percentage points. Education is estimated to significantly raise the quality of civic knowledge, as well, with quality measured by frequency of newspaper reading.

Another study similarly finds that more schooling substantially and significantly boosts voter turnout. High school graduation is estimated to raise the probability of voting by 29-34 percentage points.[11] This suggests that had high school completion among those at least 25 years old not risen by 36 percentage points between 1964 and

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[9] A small body of literature focuses on twins to take advantage of their shared characteristics (e.g., genetic endowment and family environment). Some analysts believe that utilizing twins mitigates the upward bias in estimated returns to education found in studies of unrelated individuals that fail to take into account unobservable traits.

The instrumental variable (IV) technique produces a consistent estimate in situations where an independent variable (e.g., educational attainment) is correlated with unobservable characteristics (e.g., the importance that parents place on civic responsibilities) that also affect the return to education (e.g., civic participation). Expressed differently, the IV method removes from the return to education that portion which is due to unmeasurable factors associated with both educational attainment and the return to education.

[10] Thomas S. Dee, "Are There Civic Returns to Education?", *Journal of Public Economics*, vol. 88 (2004).

[11] Kevin Milligan, Enrico Moretti, and Philip Oreopoulos, "Does Education Improve Citizenship? Evidence from the United States and the United Kingdom," *Journal of Public Economics*, vol. 88 (2004).

2000, voter turnout in the 2000 election would have been 10-12 percentage points lower than it was (all else being equal). Education also appears to enhance the quality of civic involvement: high school graduates more often attend political and community meetings, volunteer in their communities, and follow media reports about public affairs compared to individuals with fewer years of education.

Crime

As schools attempt to instill the shared values and rules of society, they may increase the emotional and mental costs to an individual of engaging in unethical or illegal activities. Teachers supervise youngsters during the school day, as well, thereby making them less available for other activities (e.g., juvenile delinquency). More years of schooling also generally raise students' future wage rates, which increases the reward of legitimate work and the opportunity cost of time spent incarcerated. Education is thought to reduce crime through these among other pathways.

According to one analysis, additional schooling does appear to significantly curb criminal activity.[12] It finds that a one-year increase in schooling lowers the likelihood of imprisonment by 0.1 percentage points for white males and 0.4 percentage points for black males. The effect of education on reducing the probability of incarceration seems strongest among those who complete high school. In addition, a one-year increase in schooling is estimated to lower, by 30%, the probability that males will be arrested for such violent crimes as murder and assault. Similarly, the likelihood of committing such property crimes as motor vehicle theft and arson falls by 20% and 13%, respectively.

The researchers further approximate the social savings to be gained from education's impact on criminal activities. A 1% increase in males' high school graduation rate could yield savings to society totaling $1.4 billion per year, or about $1,170-$2,100 annually per additional male high school graduate.[13] The authors conclude that the social benefits per additional graduate, which are reaped each year over their lives, compare favorably with the direct cost per student of one year of secondary school.

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[12] Lance Lochner and Enrico Moretti, "The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports," *The American Economic Review*, vol. 94, no. 1 (2004).

[13] Ibid. Note: The social savings result from an estimated 94,310 fewer violent (murder, rape, robbery, and assault) and property (burglary, larceny/theft, motor vehicle theft, and arson) crimes in a year. The savings are a combination of victim costs (i.e., productivity and wage losses, medical costs, and reduced quality of life) and incarceration costs.

Economic Growth

Schools, through their teaching and research functions, are thought to promote economic growth and thereby raise living standards.[14] Teachers transmit knowledge to each new generation of students, which

- facilitates their subsequent understanding and adoption of better ways of doing things in the workplace (e.g., more efficient production methods, inventory management, and managerial techniques), and
- prepares them to create and innovate while employed in the private sector.

Faculty members and their research assistants also develop new applications of knowledge (e.g., scientific and technological advances) that largely are implemented outside the education industry where they too may increase the rate at which the economy is able to expand. In addition, as they interact in workplaces and communities with highly educated individuals, others are thought to formally or informally learn from them. Through these various channels, a nation's or neighborhood's productivity or "labor quality," and hence per-person income or earnings, is posited to rise beyond the individual increase in productivity.[15]

Many of the studies that investigate variations across countries in schooling and growth estimate that a nation's initial stock of human capital (e.g., average years of schooling) significantly increases the national income level (i.e., per capita gross domestic product). There is some evidence that productivity and economic growth is achieved by education's enabling countries to adopt imported technologies, thereby allowing less developed nations to catch-up with more developed nations. Research also suggests that postsecondary education in particular is important to continued growth in more developed nations, perhaps because workers must possess some minimum quality level to utilize or develop technological advances.

These cross-country studies do not find that *increases* in educational attainment cause per-person income to grow beyond private returns, however. This result runs counter to conventional wisdom, which holds that the rate at which highly qualified persons are supplied to the labor market must increase for a nation's growth rate to

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[14] Economic growth achieved through increases in efficiency (i.e., output per hour worked or per worker) raises national living standards if, as theorized, greater productivity results in higher individual earnings. For more information see CRS Report RL32987, *Long-Term Growth of the U.S. Economy: Significance, Determinants, and Policy*, by Craig K. Elwell.

[15] Some growth accounting models only take into account the direct or private monetary return to human capital investment. For example, if individual productivity increases by 10% due to an additional year of education, then average productivity across the nation will rise by 10% due to the average schooling increase. These individual effects on economic growth are discussed later in this report in terms of the private return to schooling. Other models allow for the possibility of human capital externalities, that is, the average productivity increase across all workers in the prior example might exceed 10%. These models and external effects are the subject of the above discussion.

continue rising over time. Many analysts question the accuracy of this counterintuitive finding, primarily because of measurement error in international databases on education that worsens when change in schooling level over time is the variable of interest.[16] The macro-growth literature also may confuse additional education leading to income growth with higher incomes leading to more schooling (i.e., reverse causality). The samples of nations utilized may include unrepresentative outliers that bias the results as well.[17] Moreover, in developing nations particularly, most of the increase in highly educated labor has found employment in such industries as government; retail trade; and business, personal, and other services — where good output measures are lacking in national income and product accounts.[18]

Studies that take this approach also generally omit such country-specific institutional characteristics as regulatory structures and political systems, for example. These among other omitted factors (e.g., the quality of a nation's educational system) presumably cause public rates of return to vary by country and within a country over time as the characteristics themselves change.[19] Accordingly, the very design of cross-country studies makes them less useful to policymakers than analyses of their own or similar nations. Thus, for example, an analysis of member countries of the Organisation for Economic Co-operation and Development (OECD) estimates that increases in persons with postsecondary education in particular have a significant and positive effect on economic growth.[20] Another study finds that the significant, positive impact of human capital on OECD nations' adoption of technology from abroad increases the higher the level of schooling in these developed countries.[21] Research suggests, however, that in OECD nations education policies intended to promote increases in the rate of economic growth will have small effects compared to the countries' current growth rates.[22] While education does appear to contribute to economic growth in developed nations, it probably should not be viewed as a panacea.

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[16] Alan B. Krueger and Mikael Lindahl, "Education for Growth: Why and For Whom?" *Journal of Economic Literature*, vol. 39 (Dec. 2001); and OECD, *The Well-being of Nations: The Role of Human and Social Capital* (2001).

[17] Jonathan Temple, "A Positive Effect of Human Capital on Growth," *Economic Letters*, vol. 65 (1999).

[18] Zvi Griliches, "Education, Human Capital, and Growth: A Personal Perspective," *Journal of Labor Economics*, vol. 15, no. 1 (Jan. 1997).

[19] For more information about the influence of school quality in a cross-country context see Robert J. Barro, "Human Capital and Growth," *American Economic Review*, vol. 91, no. 2 (2001); and Eric A. Hanushek and Dongwook Kim," Schooling, Labor Force Quality, and the Growth of Nations," *American Economic Review*, vol. 90, no. 5 (2000).

[20] Norman Gemmell, "Evaluating the Impacts of Human Capital Stocks and Accumulation on Economic Growth: Some New Evidence," *Oxford Bulletin of Economics and Statistics*, vol. 58, no. 1 (1996).

[21] Hans-Jurgen Engelbrecht, "Human Capital and Economic Growth: Cross-Section Evidence for OECD Countries," *The Economic Record*, vol. 79, special issue (June 2005), p. S49.

[22] Temple, *Growth Effects of Education and Social Capital in the OECD Countries*.

An alternative approach that focuses on geographic areas within the United States avoids the above-mentioned shortcomings of cross-country studies. It similarly posits that, in the presence of externalities, a greater stock of human capital (i.e., higher average schooling) in an area will cause area income from jobs (i.e., average wages) to rise above the earnings gains accorded more education persons (i.e., the private return to education).

One analysis utilizes U.S. states as the labor market area of interest. It estimates modest, imprecise effects of variations in state average schooling levels on state average wages, after controlling for individual effects. Nonetheless, the authors note that the social rate of return — which they estimate ranges from 1% to 3% — is still of sufficient size "to justify significant public subsidies for education."[23] As the study is confined to white males aged 40-49, secondary education, and states, other analyses that cover different demographic groups, educational levels, and geographic areas may yield more substantial social returns.

Indeed, another study finds that others do benefit to a greater degree from employment in metropolitan areas with large shares of workers having postsecondary education. Specifically, a one percentage point increase in a metropolitan area's share of workers with at least a college degree raises the earnings of high school dropouts by 1.9%, high school graduates by 1.6%, persons with some college by 1.2%, and the earnings of college graduates themselves by 0.4% — beyond the private return to education.[24] These results imply that the attraction of college-educated workers is a worthwhile component of publicly funded economic development programs for urban areas. (An increase in the proportion of college-educated persons at the national level is unlikely to yield such large social returns, however, because the estimates reflect holding constant the college-educated share of workers in all other metropolitan areas.)

Like the state-based study discussed above, this analysis also finds that increases at the lower end of the educational distribution (i.e., a greater share of high school graduates in a metro area) are unlikely to generate large positive externalities. Perhaps, then,

> if human capital is expanded at higher levels of education, the benefits of the spillover are in the form of technological progress and higher productivity. If human capital is expanded at lower levels, the benefits are in the form of reductions in crime and lower welfare participation.[25]

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[23] Daron Acemoglu and Joshua Angrist, "How Large are Human-Capital Externalities? Evidence from Compulsory Schooling Laws," *NBER Macroeconomics Annual*, vol. 15 (MA: The MIT Press, 2000), p. 48.

[24] Enrico Moretti, "Estimating the Social Returns of Higher Education: Evidence from Longitudinal and Repeated Cross-Sectional Data," *Journal of Econometrics*, vol. 121 (2004).

[25] Ibid., p. 207.

The Private Benefits of Education

Some analysts consider transfers from an educated individual to anyone else to be social benefits. Others categorize intra-family transfers (e.g., to children) as private benefits. This report takes the latter approach. Researchers also differ in their classification of benefits as monetary or non-monetary. Some regard an individual's compensation (earnings and benefits) to be the sole financial return to education. Others include labor market advantages more often enjoyed by better paid persons (e.g., less unemployment) as monetary benefits. This report adopts the latter convention.

Own Health

Better own health probably is the leading non-financial benefit of education to individuals.[26] Studies find a strong, positive association between years of schooling and health status measured in various ways (e.g., self-reported health, mortality rates, and physiological indicators of health).

Three, not mutually exclusive, explanations typically are offered for this direct correlation:

- More educated persons are less likely to engage in unhealthy behaviors, perhaps because they are better informed about health matters. Their superior problem-solving skills may enable them to better utilize the health care system as well.
- Childhood illness may curtail years spent in school. Healthier students may more readily add to their human capital and have more years in which to reap the rewards of their additional schooling.
- Future-oriented persons (i.e., those willing to defer rewards) are more likely to invest in all types of human capital — both education and health.

The first explanation suggests that more education causes better health. In the next explanation causality runs in the opposite direction — from better health to more education. The final explanation implies there are one or more unobserved factors (e.g., genetic endowment) associated with schooling that actually determine health status; if such variables are not accounted for, education's role in the improvement of health may be overstated.

The degree to which each explanation is correct has important implications for policymakers. If a goal is having a healthier population in order to minimize Medicare and Medicaid expenditures, for example, and causality largely runs from health to education, then greater education spending would not be the most efficient means to the goal's realization.

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[26] Other private non-pecuniary benefits include more efficient household management (e.g., greater use of new technologies for the home among higher educated individuals) and attainment of desired family size (e.g., level of educational attainment is directly related to effective use of contraceptives).

Although they do not eliminate the possibility of reverse causality or the role of unobserved factors, several analyses show that more schooling does exert an independent and positive effect on health.[27] One study finds that education significantly improves the health outcomes of older workers (i.e., 51-61 year old women and men).[28] The effect of greater educational attainment on health outcomes appears stronger among older women than men. Health status is measured by self-reported ratings of such abilities as climbing stairs, walking, and bathing. Another analysis utilizes as health indicators the likelihood of having work-limiting conditions and of requiring personal care. It suggests that males who extend high school attendance by one year reduce their probability of incurring work-limiting disabilities by 2.6 percentage points.[29] An additional year of high school also lowers the likelihood of subsequently requiring personal care by a statistically significant 0.67 percentage points. More education extends the life expectancy of adults, according to a third study: another year of high school lowers their mortality rate by 4-6 percentage points.[30]

Child Well-Being

Not only does schooling level improve an individual's own health, but it also may improve child well-being through better health outcomes. A study of the causal relationship between parental education and children's health estimates that more educated mothers give birth to healthier infants. Specifically, increased college attendance among first-time mothers significantly reduces the incidence of both low birth weight and premature delivery.[31] This, in turn, implies large savings both for families and society given the higher medical, educational, and other costs associated with low-birth-weight youngsters.

In addition, greater parental education may enhance child well-being through improved educational outcomes. An analysis finds that a one-year increase in parental schooling significantly dampens the likelihood of a child repeating a grade (by 2-7 percentage points).[32] It also finds that more-educated parents improve their children's schooling outcomes by lowering the probability of dropping out of high

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[27] For a review of the literature see Michael Grossman and Robert Kaestner, "Effects of Education and Health," in Jere R. Behrman and Nevzer Stacey, eds., *The Social Benefits of Education*, (MI: The University of Michigan Press, 1997).

[28] Scott J. Adams, "Educational Attainment and Health: Evidence from a Sample of Older Adults," *Education Economics*, vol. 10, no. 1 (2002).

[29] Jeremy Arkes, "Does Schooling Improve Adult Health?," *RAND Health*, DRU-3051 (May 2003).

[30] Adriana Lleras-Muney, "The Relationship between Education and Adult Mortality in the United States," *The Review of Economic Studies*, vol. 72, no. 250 (Jan. 2005).

[31] Janet Currie and Enrico Moretti, "Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings," *Quarterly Journal of Economics*, v. 118, no. 4 (Nov. 2003).

[32] Philip Oreopoulos, Marianne E. Page, and Ann Huff Stevens, *Does Human Capital Transfer from Parent to Child? The Intergenerational Effects of Compulsory Schooling*, National Bureau of Economic Research, Working Paper no. 10164, Dec. 2003.

school (by 3-5 percentage points). Another study alternatively estimates that, after controlling for intergenerational "ability bias" due to unobserved inherited endowments and to marital sorting (i.e., more educated women tend to wed more educated men), mother's schooling has a negative but not quite statistically significant influence on child educational attainment while father's schooling has a positive and significant impact.[33]

When individuals enter the labor market rather than continuing in school, it is unlikely that they consider how their choices will affect the well-being of their potential children. A college education may, for example, improve parenting skills in the future or the kind of social network to which they can offer their children access. Some policymakers similarly may not take an intergenerational perspective when developing educational policy. If there is a public component to this private benefit and it is not recognized, underinvestment in education over the long-run may result.

Earnings

In the not-too-distant past, individuals who graduated from high school were considered well-equipped to succeed in the labor market — that is, obtain comparatively well-paid jobs that they could remain in for most of their work lives. The situation appears to have changed over the last few decades when the pace of economic change accelerated. The wage gap between less and more educated workers widened as postsecondary education became a seemingly necessary prerequisite to high-paid secure employment.[34] Although people reportedly think it no longer possible to obtain "lifetime jobs," individuals with postsecondary schooling are regarded as more likely to adjust to technological changes without experiencing unemployment and to better rebound from displacement related to international competition for example.[35] Higher education thus appears to have become more important to employment — if not job — security, and to earnings stability over the course of a working life.

The labor market returns to education typically are manifested not only through a greater probability of high earnings and low unemployment, but also through more common employer provision of benefits (e.g., health insurance) and better working conditions. But, the most studied labor market benefit of education is earnings. According to human capital theory, individuals' wages are based on their initial productivity (e.g., ambition and innate ability), investments in their productivity (e.g., schooling and on-the-job training), and supply-demand conditions for persons with

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[33] Jere R. Behrman and Mark R. Rosenzweig, "Does Increasing Women's Schooling Raise the Schooling of the Next Generation?", *American Economic Review*, vol. 92, no. 1 (2002). Note: This study has been criticized for, among other things, its probably unrealistic assumption that twins differ in terms of education but not in terms in other characteristics or experiences that can affect the schooling level of their children.

[34] CRS Report 95-1081, *Education Matters: Earnings by Educational Attainment Over Three Decades*, by Linda Levine.

[35] For more information see CRS Report RL32292, *Offshoring (a.k.a. Offshore Outsourcing) and Job Insecurity Among U.S. Workers*, by Linda Levine.

comparable skills and experience. Economists assume that people make the same sort of implicit benefit-cost comparisons with regard to undertaking further productivity investments as other investments. Specifically, people seemingly decide whether to accumulate more human capital by comparing anticipated lifetime benefits (e.g., the stream of earnings from college graduation to retirement) with costs (e.g., earnings forgone while attending college and out-of-pocket expenses for tuition and books less student aid).[36] If this comparison yields an anticipated rate of return that exceeds the market interest rate on alternative investments, then wealth-maximizing individuals are hypothesized to continue their schooling.

Empirical studies that utilize a variety of statistical techniques estimate the causal effect of education on individual earnings — that is, the private monetary return to one more year of schooling — ranges from about 6% to 11%.[37] As this generally compares favorably with the return on other investment opportunities, the pursuit of additional formal education seems an economically sound choice for the average person. The profitability of education appears to vary by population subgroup (e.g., income category and gender), schooling level, college major, and type of postsecondary institution (e.g., research universities versus liberal arts colleges).[38] There also is evidence that the average return to education changes over time: in the United States, it has risen in recent decades as the increased demand for college-educated workers seemingly outpaced their increased supply. And, estimation of the rate of return is subject to limitations that can bias it downward or upward (e.g., the cost of postsecondary school may be omitted as may unobserved determinants of schooling level; neither the quality of education nor the differential probability of unemployment by education level typically are taken into account; and schooling as well as earnings may be incorrectly reported). Nonetheless, rate of return "analysis remains an objective tool for comparing the costs and benefits of education and for

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[36] Because of difficulties involved in measuring these costs, empirical research often ignores some or all of them. Thus, the estimated wage advantage conferred by education usually reflects the gross rather than net return.

[37] David Card, "The Causal Effect of Education on Earnings," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, vol. 3A (Oxford, UK: Elsevier Ltd., 1999). Note: The range reflects the difference in rates of return calculated by directly including educational attainment in ordinary-least-squares (OLS) regressions and by using instrumental variables (IV) to represent schooling. It initially was thought that use of the IV technique would improve estimation of education's unique benefits by accounting for unobservable variables not picked up in OLS analyses. However, the returns to education utilizing IVs have been greater and less precisely estimated than those derived from OLS. While this could be interpreted to mean that the upward (ability) bias in OLS estimates of education's rate of return is more than offset by the downward (measurement) bias, it also could mean that IV estimates capture heterogeneity within the student population. With regard to the latter possibility, the private return based on the IV technique might be higher because it reflects the above-average earnings gains of children from low-income families who are the individuals most likely to be affected by increases in the legal minimum age at which one can leave school and by the proximity of relatively more affordable community colleges. (Changes in compulsory schooling laws and distance to community colleges are two commonly employed IVs.)

[38] Laura W. Perna, "The Benefits of Higher Education: Sex, Racial/Ethnic, and Socioeconomic Group Differences," *Review of Higher Education*, vol. 29, no. 1 (fall 2005).

arriving at an estimate, albeit not precise, of the economic value of schooling" both for individuals and society.[39]

Concluding Remarks

A voluminous literature on the private market-based return to education has developed over the last 40 years, with advances in statistical techniques applied to estimation of the earnings premium from schooling as recently as the 1990s. These studies of the causal relationship between schooling and earnings have produced rates of return to education that suggest undertaking further formal education is a financially worthwhile endeavor for individuals. Schooling becomes even more beneficial in light of the non-monetary returns it seemingly accords individuals, although values are rarely developed for this kind of benefit.[40]

Knowledge of the size of the social return to education is important for policymakers in their deliberations over public investment in education vis-a-vis other government functions, and in their deliberations over schooling expenditures by the public sector compared to spending by students and their families. In contrast to their long-standing work on private market-based rates of return, researchers have much more recently focused on the degree to which formal education causes public monetary and non-monetary benefits. The number of such empirical studies is increasing, but estimates of the social return's magnitude remain scarce. Results are inconsistent as well, but they do provide evidence of the existence of human capital externalities — that is, government investment in education is justified. Although the progress made in estimating the private monetary return to schooling implies that researchers will be able to one day approximate the magnitude of its public return, that day may be some time off given the daunting analytical task of precisely measuring the monetary and non-monetary benefits that spill over from highly educated persons to other members of society.

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[39] Menon, *An Evaluation of Four Decades of RoR Analysis in Higher Education Policy Marking*, p. 379.

[40] Two analysts utilize results from other empirical research on the private non-monetary benefits of education to develop estimates of their value. After making stringent assumptions, they calculate that the improvement in an individual's own health from an additional year of schooling is worth a one-time increase of some $9,000 in net family assets; while the value of gains in children's cognitive development due to a parent's additional education varies widely, it perhaps is equal to an average annual increase in family income of at least $500; and the increase in household efficiency related to another year of schooling is valued at about $300 per year on average. Barbara L. Wolfe and Robert H. Haveman, "Social and Nonmarket Benefits from Education in an Advanced Economy," in Yolanda K. Kodrzycki, ed., *Education in the 21st Century: Meeting the Challenges of a Changing World*, 47th Economic Conference Proceedings, Federal Reserve Bank of Boston, June 2002.